CURRENT STATUS OF THE CLAIMS

In the Claims

The following is a marked-up version of the claims with the language that is underlined ("___") being added and the language that contains strikethrough ("—") being deleted:

1. – 10. (Canceled)

11. (Presently Pending) A structure for unfocused guided-wave optical clock distribution, comprising:

an integrated circuit device;

a first cladding layer disposed on the back-side of the integrated circuit device; and

a core layer disposed on the first cladding layer, the core layer including:

at least one vertical-to-horizontal input diffraction grating configured to diffract a clock signal from the vertical plane to the horizontal plane in a plurality of directions, such that the clock signal is uniformly distributed through the core layer;

at least one horizontal-to-horizontal diffraction grating configured to diffract the clock signal through the horizontal plane in a plurality of directions, such that the clock signal is uniformly distributed through the core layer; and

at least one horizontal-to-vertical output diffraction grating configured to diffract the clock signal from the horizontal plane to the vertical plane in a plurality of directions, such that the clock signal is uniformly distributed through the core layer.

12. (Original) The structure of claim 11, wherein the first cladding layer is a write-wavelength vertical reflection absorption layer.

13. (Original) The structure of claim 11, further comprising:

a second cladding layer adjacent to the core layer.

14. (Original) The structure of claim 11, further comprising:

a horizontal reflection absorption layer adjacent to the core layer.

15. (Original) The structure of claim 11, further comprising:

at least one chip-level detector on the integrated circuit device.

16. (Original) The structure of claim 11, further comprising:

at least one chip-level optical via; and

a printed wiring board substrate connected to the integrated circuit device.

17. (Original) The structure of claim 16, wherein the at least one optical via is a dielectric filled through-wafer via.

18. (Original) The structure of claim 11, further comprising:

at least one chip-level optical source.

19. (Currently Amended) A structure for unfocused guided-wave optical clock distribution, comprising:

an integrated circuit device;

a first cladding layer disposed on the back-side of the integrated circuit device, wherein the first cladding layer includes at least one vertical-to-horizontal input diffraction grating, at least one horizontal-to-horizontal diffraction grating, and at least one horizontal-to-vertical output diffraction grating; ~~and~~

a core layer disposed on the first cladding layer<u>; and</u>

<u>a vertical reflection absorption layer adjacent to the first cladding layer</u>,

wherein at least one of the diffraction gratings is configured to diffract a clock

signal in a plurality of directions, such that the clock signal is uniformly distributed through the first cladding layer.

20. (Original) The structure of claim 19, wherein the at least one vertical-to-horizontal input diffraction grating is a multiplexed grating and the at least one horizontal-to-vertical output diffraction grating is a multiplexed grating.

21. (Original) The structure of claim 19, wherein the first cladding layer is comprised of a grating selected from volume gratings, surface-relief gratings, multiplexed volume gratings, double-sided surface relief gratings, and combinations thereof.

22. (Currently Amended) A structure for unfocused guided-wave optical clock distribution, comprising:

an integrated circuit device;

a first cladding layer disposed on the back-side of the integrated circuit device;

a core layer disposed on the first cladding layer, ~~and~~

a second cladding layer disposed on the core layer, wherein the second cladding layer includes at least one vertical-to-horizontal input diffraction grating, at least one horizontal-to-horizontal diffraction grating, and at least one horizontal-to-vertical output diffraction grating, and

a vertical reflection absorption layer adjacent to the second cladding layer,

wherein at least one of the diffraction gratings is configured to diffract a clock signal in a plurality of directions, such that the clock signal is uniformly distributed through the second cladding layer.

23. (Canceled)

24. (Currently Amended) The structure of claim 22 ~~23~~, wherein the vertical reflection

absorption layer absorbs at an optical wavelength which is transparent to the device substrate.

25. (Presently Pending) A device, comprising:

a structure having a core layer disposed on the back-side of the structure, at least one vertical-to-horizontal input diffraction grating within the core layer, at least one horizontal-to-horizontal diffraction grating within the core layer, at least one horizontal-to-vertical diffraction output grating within the core layer, and at least one cladding layer engaging the core layer,

wherein an optical clock signal is propagated in a plurality of directions, such that the clock signal is uniformly distributed vertically through the structure to the core layer, into the at least one vertical-to-horizontal input diffraction grating and is then distributed in a plurality of directions, such that the clock signal is uniformly distributed laterally through the at least one horizontal-to-horizontal diffraction grating to the at least one horizontal-to-vertical output diffraction grating, which distributes the optical clock signal in a plurality of directions, such that the clock signal is uniformly distributed vertically back through the structure substrate.

26. (Original) A device of claim 25, wherein the structure for optical clock distribution is included in a microelectronic device.

27. (Original) A device of claim 25, wherein the structure for optical clock distribution is included in an integrated optical device.

28. (Currently Amended) A method for fabricating a device having unfocused guided-wave optical clock distribution comprising:

providing a substrate having a first cladding layer disposed thereon;

disposing a core layer on the first cladding layer;

forming vertical-to-horizontal input diffraction gratings within the core layer;

forming horizontal-to-horizontal diffraction gratings within the core layer; and

forming horizontal-to-vertical output diffraction gratings within the core layer,

disposing a second cladding layer on the core layer; and

disposing a vertical reflection absorption layer on the second cladding layer,

wherein at least one of the diffraction gratings is configured to diffract a clock signal in a plurality of directions, such that the clock signal is uniformly distributed through the core layer.

29. (Original) The method of claim 28, further comprising:

etching away a portion of the core layer at the edges of the substrate and replacing it with a horizontal reflection absorption layer.

30. (Original) The method of claim 28, wherein the device includes at least one detector.

31. (Original) The method of claim 28, wherein the device includes an optical via and further comprising a packaging layer and a printed wiring board substrate.

32. (Original) The method of claim 28, wherein the device includes an optical source.

33-34. (Canceled)

35. (Currently Amended) A method for fabricating a device having unfocused guided-wave optical clock distribution comprising:

providing a substrate having a first cladding layer disposed thereon;

forming vertical-to-horizontal input diffraction gratings within the first cladding layer;

forming horizontal-to-horizontal diffraction gratings within the first cladding layer;

forming horizontal-to-vertical output diffraction gratings within the first cladding layer; ~~and~~

disposing a core layer on the first cladding layer;

disposing a second cladding layer on the core layer; and

disposing a vertical reflection absorption layer on the second cladding layer,

wherein at least one of the diffraction gratings is configured to diffract a clock signal in a plurality of directions, such that the clock signal is uniformly distributed through the first cladding layer.

36. (Currently Amended) A method for fabricating a device having unfocused guided-wave optical clock distribution comprising:

providing a substrate having a first cladding layer disposed thereon;

disposing a core layer on the first cladding layer;

disposing a second cladding layer on the first cladding layer;

forming vertical-to-horizontal input diffraction gratings within the second cladding layer;

forming horizontal-to-horizontal diffraction gratings within the second cladding layer; ~~and~~

forming horizontal-to-vertical output diffraction gratings within the second cladding layer;

disposing a second cladding layer on the core layer; and

disposing a vertical reflection absorption layer on the second cladding layer,

wherein at least one of the diffraction gratings is configured to diffract a clock signal in a plurality of directions, such that the clock signal is uniformly distributed through the second cladding layer.

37. (Currently Amended) A system for fabricating a device having back-side-of-die, through-wafer optical clock distribution comprising:

means for providing a substrate having a first cladding layer disposed thereon;

means for disposing a core layer on the first cladding layer;

means for forming vertical-to-horizontal input diffraction gratings within the core layer;

means for forming horizontal-to-horizontal diffraction gratings within the core layer; ~~and~~

means for forming horizontal-to-vertical output diffraction gratings within the core layer;

means for disposing a second cladding layer on the core layer; and

means for disposing a vertical reflection absorption layer on the second cladding layer,

wherein at least one of the diffraction gratings is configured to diffract a clock signal in a plurality of directions, such that the clock signal is uniformly distributed through the core layer.

38. (Presently Pending) A structure for unfocused guided-wave optical clock distribution, comprising:

an integrated circuit device;

a first cladding layer disposed on the back-side of the integrated circuit device;

a core layer disposed on the first cladding layer, wherein the core layer includes at least one vertical-to-horizontal input diffraction grating, at least one horizontal-to-horizontal diffraction grating, and at least one horizontal-to-vertical output diffraction grating, wherein an optical clock signal is propagated vertically through the structure substrate to the core layer, into the at least one vertical-to-horizontal input diffraction grating and is then distributed laterally through the at least one horizontal-to-horizontal diffraction grating to the at least one horizontal-to-vertical output diffraction grating, which distributes the optical clock signal vertically back through the structure substrate;

at least one chip-level optical via; and

a printed wiring board substrate connected to the integrated circuit device,

wherein the first cladding layer is a write-wavelength vertical reflection absorption layer,

wherein the at least one optical via is a dielectric filled through-wafer via, and

wherein at least one of the diffraction gratings is configured to diffract a clock signal in a plurality of directions, such that the clock signal is uniformly distributed through the core layer.

39. (Newly Added) The structure of claim 19, further comprising:

a horizontal reflection absorption layer adjacent to the core layer.

40. (Newly Added) The structure of claim 19, wherein the vertical reflection absorption layer absorbs at an optical wavelength which is transparent to the device substrate.

41. (Newly Added) A structure of claim 19, wherein the structure for optical clock distribution is included in a microelectronic device.

42. (Newly Added) A structure of claim 19, wherein the structure for optical clock distribution is included in an integrated optical device.

43. (Newly Added) The structure of claim 22, wherein the at least one vertical-to-horizontal input diffraction grating is a multiplexed grating and the at least one horizontal-to-vertical output diffraction grating is a multiplexed grating.

44. (Newly Added) The structure of claim 22, wherein the first cladding layer is comprised of a grating selected from volume gratings, surface-relief gratings, multiplexed volume gratings, double-sided surface relief gratings, and combinations thereof.

45. (Newly Added) The structure of claim 22, further comprising:

a horizontal reflection absorption layer adjacent to the core layer.

46. (Newly Added) A structure of claim 22, wherein the structure for optical clock distribution is included in a microelectronic device.

47. (Newly Added) A structure of claim 22, wherein the structure for optical clock distribution is included in an integrated optical device.

48. (Newly Added) The device of claim 25, further comprising:

a horizontal reflection absorption layer adjacent to the core layer.

49. (Newly Added) The device of claim 25, wherein the at least one vertical-to-horizontal input diffraction grating is a multiplexed grating and the at least one horizontal-to-vertical output diffraction grating is a multiplexed grating.

50. (Newly Added) The device of claim 25, wherein the first cladding layer is comprised of a grating selected from volume gratings, surface-relief gratings, multiplexed volume gratings, double-sided surface relief gratings, and combinations thereof.

51. (Newly Added) The device of claim 25 further comprising: a vertical reflection absorption layer adjacent to the second cladding layer.

52. (Newly Added) The device of claim 51, wherein the vertical reflection absorption layer absorbs at an optical wavelength which is transparent to the device substrate.